

Favorinus elenalexiae, a new species (Opisthobranchia: Aeolidiidae) from the eastern Pacific Ocean

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ABSTRACT

A new species of Nudibranchia, belonging to the genus *Favorinus* Gray, 1850, is described. It differs from other species of that genus mainly by its rhinophoral ornamentation: *Favorinus elenalexiae* new species has three large, overlapping flanges with the upper margins free, like three cups, in almost all the species the rhinophores are papillated or lamellated. The external anatomy, radula, and reproductive system are described and compared with those of other species of the genus. A table comparing summarizing the differences amongst the species of the genus *Favorinus* is included.

Additional key words: Nudibranchia, taxonomy.

INTRODUCTION

The genus *Favorinus* includes fourteen species characterized by the presence of a cleioproct position of the anus. The cerata are arranged in arched clusters, lacking cnidosac, the masticatory edge of the jaws have several rows of denticles and the radular teeth are modified to feed on the eggs of other gastropods. The teeth have very elongate cusp and completely lack or have very reduced denticles. In this paper, a new species of this genus from the eastern Pacific is described and a comparison with other *Favorinus* species is presented.

SYSTEMATICS

Genus *Favorinus* Gray, 1850

Favorinus elenalexiae new species

Figures 1–7, Table 1

Description: *External anatomy:* The body is elongate (figure 1). The largest specimen examined was 15 mm long in distended state. The body has up to 7 ceratal groups on each side. The three anterior groups are horseshoe-shaped, while the rest are oblique rows slightly curved at their distal end (figure 2b). The number of cerata in the clusters was 16, 12, 11, 5, 4, 2, and 2 in a specimen 14.5 mm length. The cerata have a smooth surface. The genital papilla lies on the

right side at the level of the first ceratal group. The anus lies on the same side at the level of the second ceratal group. The rhinophores are blunt-tipped and have three large overlapping flanges with the upper margins free in the manner of three cups (figure 2a). On the anterior and posterior surface of the rhinophores there is a thin crest joining the flanges. The oral tentacles are long and cylindrical and the propodial tentacles are long and possess a ventral, longitudinal groove. The foot is relatively broad and the tail is long and pointed.

The background color is translucent white. On the head and back there are fine opaque white dots, which can come together as spots of different sizes, except at the base of the rhinophores and base of the oral tentacles. The oral tentacles are translucent white at the base and opaque white along their upper middle. The rhinophores are dark brown except for their base, which is translucent white and their apexes, which are opaque white. The cerata have white spots distributed on their surface; at the level of the cnidosacs the spots join as an irregular ring around the cerata. Internally to the cerata, the extensions of the digestive gland are pinkish (figure 2c). All the digestive branches of a cluster of cerata are joined at the base of the cluster. The digestive branches are pink in color. The foot is translucent white.

Internal anatomy: Two specimens were dissected, with 14.5 and 15 mm length. Salivary glands were not found. The radulae have 19 and 20 teeth, respectively. All the teeth consist of an arched base with an elongate cusp. Both sides of the cusp are smooth and the apex is sharply pointed (figures 3a, 4). There are no basal denticles. The two jaws are large and amber in color. The masticatory edge is long and curved toward the convex face of the jaw at the outer middle (figure 3b). Along the edge are four or five rows of small conical denticles and a marginal row of long conical denticles (figures 3c, 5).

The reproductive system is illustrated in figure 6. The



Figure 1. *Favorinus elenalexiae*. External view.

gonad empties into a hermaphroditic duct, which enlarges in anterior direction as an ampulla. This is long and coiled, bifurcating at its anterior end into the deferent duct and the inner oviduct. The deferent duct is short; it enlarges into a short prostate, which leads to the penial papilla. Just anterior to the penial papilla, the prostate gives way to a straight post-prostatic duct that connects to the penial papilla. The penis is conical, unarmed, and pointed apically.

The inner oviduct connects to a small and spherical seminal receptacle. The inner oviduct connects to the outer oviduct, which penetrates the female gland. This latter is large and envelopes the seminal receptacle. From the female gland, the vaginal duct proceeds to the genital orifice.

Type material: Holotype: MNCN 15.05/32051, 12 mm length, leg. Francisco J. García, 12 Feb. 1997; Paratype: MNCN 15.05/32230, 2 paratypes, 7 and 5 mm length, Isla Coiba, Pacific coast of Panamá, intertidal zone, leg. Francisco J. García, 8 Feb. 1997.

Type locality: Isla Coiba, Pacific coast of Panamá, 3 m depth.

Other material examined: Cuvitas, North of Punta la Gringa, Bahía de los Angeles, Baja California, México, 6 m depth, 1 specimen 6 mm total length, leg. Hans Bertsch, 1 Nov. 1993; South side Isla Cerralvo,

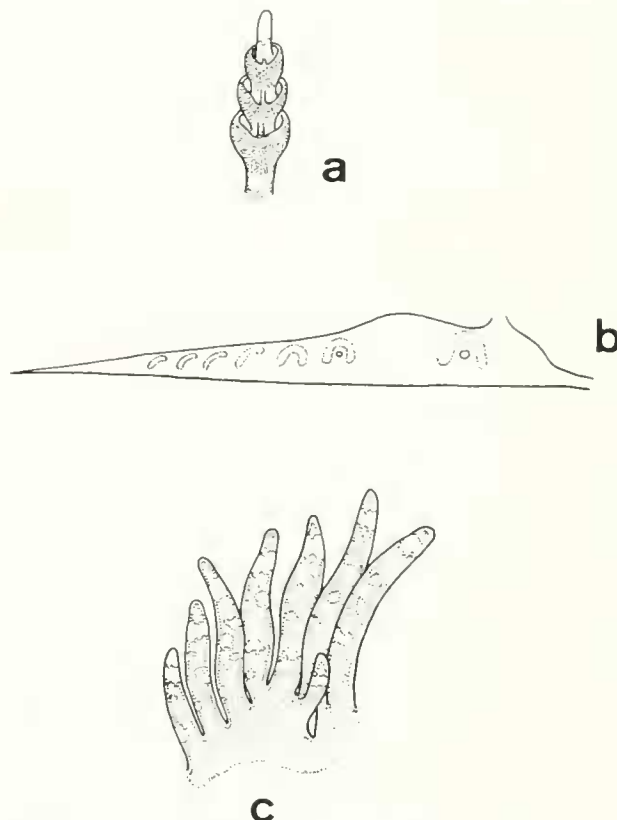


Figure 2. *Favorinus elenalexiae*. a. Rhinophore. a. Diagrammatic right profile showing the insertion of the cerata and position of the anus and reproductive apertures. c. Cerata cluster.

Baja California Sur, México, 2 specimens, with egg masses, 5 m depth, 7 June 1985 (one of these used for SEM); Punta de Mita, Navarit, Mexico, 1 specimen, 9 mm length, 6 m depth, leg. Hans Bertsch, 17 July 1991; Guanacaste, west Costa Rica, 4 specimens, 6 m depth, leg. Antonio J. Ferreira, 13 Feb. 1972; CASIZ SS218, Islas Ladrões, Pacific Coast of Panamá, 1 specimen, 12.5 m depth, leg. Marty Beals, 13 Apr. 1993; CASIZ SS217, Isla Montuosa, Pacific Coast of Panamá, 12.2 m depth, 1 specimen, leg. Terrence M. Gosliner, 15 Apr. 1993; CASIZ SS135, Isla Jicarita, Pacific Coast of Panamá, 8.53 m depth, 1 specimen, leg. Terrence M. Gosliner, 17 Apr. 1993; CASIZ SS216, Islas Contreras, Pacific Coast of Panamá, 6 m depth, 19 Apr. 1993, 3 specimens, leg. Terrence M. Gosliner; CASIZ SS222, Islas Secas, Pacific Coast of Panamá, 19.2 m depth, 5 specimens, leg. Terrence M. Gosliner, 21 Apr. 1993; CASIZ 97531, Isla Darwin, Galapagos Islands, Ecuador, 18.28 m depth, 1 specimen, leg. Terrence M. Gosliner, 13 May 1994; CASIZ 97510, Isla Isabela, Galapagos Islands, Ecuador, 31.4 m depth, 1 specimen, leg. Terrence M. Gosliner, 14 May 1994; CASIZ 97522, Isla Rabida, Galapagos Islands, Ecuador, 1 specimen, 27.12 m depth, leg. Terrence M. Gosliner, 16 May 1994; Isla Coiba, Pacific coast of Panamá, intertidal zone, 4 specimens 15, 14.5, 5.5,

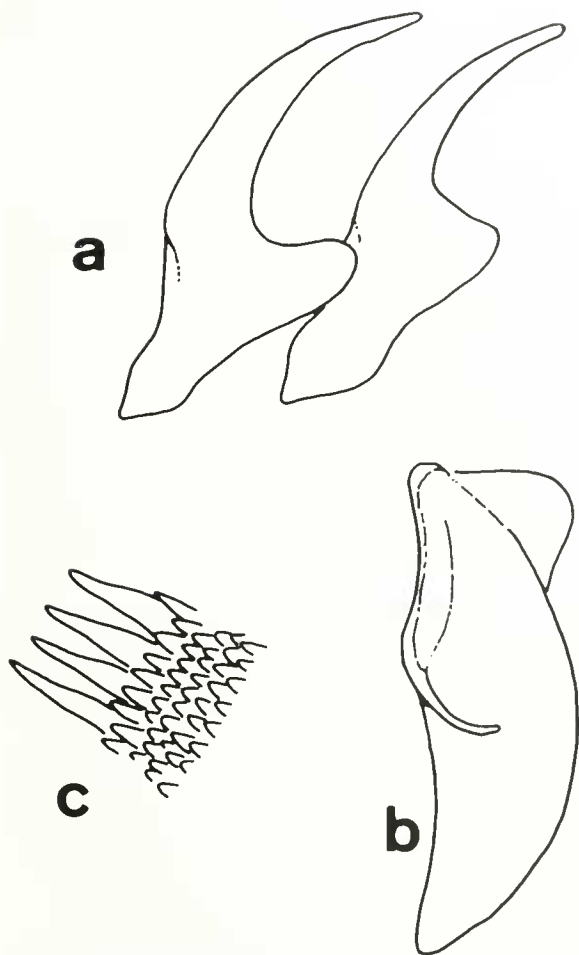


Figure 3. *Favorinus clenalexiae*. a. Radular teeth. b. Jaw. c. detail of the masticatory edge.

and 3.5, mm in length, leg. Francisco J. García, 8 Feb. 1997.

Distribution (Figure 7): From Bahía de Los Angeles, Baja California, México, to the Pacific coast of Panamá.

Etymology: The name of this species, *clenalexiae*, is a juxtaposition of the names of the youngest daughters of F. J. García and J. S. Troncoso, respectively, Elena and Alexia.

DISCUSSION

The most similar species of *Favorinus clenalexiae* is *F. tsuruganus* Baba and Abe, 1964. This species, described from Japan, was referred to originally as having rhinophores with two bulbs (Baba and Abe, 1964). Later on, however, these authors described the rhinophores as having three cup-shaped flanges (Baba and Abe, 1975), a feature also mentioned in the description of specimens from Eastern Australia by Willan (1953). Willan (*op. cit.*) stated that this character of the rhinophores was known only in *F. tsuruganus*, giv-

ing that other *Favorinus* species then known have the rhinophores with bulbs along their shaft or are lamellate. Therefore, *F. clenalexiae* constitutes the second species of the genus bearing that character.

Favorinus clenalexiae differs from *F. tsuruganus*, however, mainly by its coloration. Although both species have a translucent white ground color and the rhinophores are dark, *F. tsuruganus* has a golden yellow or brownish-yellow head, while that of *F. clenalexiae* is opaque white. The cerata have a deep black cnidosac area and the digestive glands are orange or orange-yellow in *F. tsuruganus*. In *F. clenalexiae*, the cerata have superficial white spots, and a white ring around the base of the cnidosac, and the digestive gland is pinkish. The number of cerata per group is slightly higher in the anterior clusters in our species, while the specimens described by Willan (1953) have more cerata in the posterior clusters. In our specimens the three anterior clusters are arched as a horseshoe, while the rest appear as a more or less curved row. In *F. tsuruganus* almost all are horseshoe-shaped (Baba and Abe, 1975).

Internally, Willan (1953) described the presence of lobe-like salivary glands with a broad duct and a cluster of spherical acini. We did not see any sign of these glands in our specimens. The masticatory edge of the jaws has the outer middle curved toward the convex surface of the jaw in *F. clenalexiae*, while in *F. tsuruganus* it is straight. The radular teeth are similar in both species. The penis of *F. tsuruganus* is u-shaped with the two limbs closely pressed (Willan, 1953). *F. clenalexiae* has a conical penis and it is straight. The internal organs of the reproductive system of *F. tsuruganus* have not been described.

F. clenalexiae has a similar color pattern to *F. mirabilis* Baba, 1955. In both species the rhinophores are dark brown, with the apex whitish, the surface of the notum and cerata are provided by small white spots and the cerata have a general pinkish color. However, other external features distinguish both species. *F. mirabilis* has the rhinophores perfoliated, the cerata set in 12 groups on either side, the general ground-color is whitish inclined to brown on the back and dorsal surface of the head, the oral tentacles and anterior edge of the foot are yellow, and each cerna is marked with a purple spot down the tip. *F. clenalexiae* has the rhinophores with 3 cup-shaped flanges, the body only has up to 7 groups of cerata on either side, the general ground color is whitish with opaque white dots more or less concentrated on the surface of the body, the oral tentacles and foot are white, and the cerata lack a purple spot and have white spots rounding the base of the cnidosac.

In a comparison between *F. clenalexiae* and the rest of the *Favorinus* species, the clearest feature permitting a differentiation is the ornamentation of the rhinophores. Features of the anatomy and coloration of *Favorinus* species are listed and compared in Table 1, making it possible to differentiate *F. clenalexiae* from

Table 1. Characters of species of *Favorinus*

Species	References	Distribution	Rhinophores	Cerata	Body coloration	Rhinophores coloration	Cerata coloration	Radula
<i>F. clendixiae</i>	Present article	Galapagos Island, Eastern Pacific coast of México, Costa Rica and Panama	3 cup-shaped flanges	Smooth	Translucent white with opaque white spots	Black brown with the apex white	White spots on the surface and endosac. Digestive gland pink	Smooth
<i>F. branchialis</i> (Bathke in Müller, 1806)	Edmunds & Marcus (1977), Puvion-Fol (1954), Cattaneo-Vietti et al., 1990	Eastern Atlantic and Mediterranean Sea	1-2 bulbs	Smooth	Translucent white with a variable pattern of opaque white blotches on the back	Brown, tip white	Upper part white opaque. Digestive gland variable brown, yellow red, green	Smooth
<i>F. jouani</i> (Risbec, 1925)	Risbec (1953)	New Caledonia	Lamellate	NA	Translucent white	Brown with the apex red	NA	5 denticles
<i>F. gouaroi</i> (Risbec, 1925)	Risbec (1953)	New Caledonia	2 rings	NA	Yellow with large opaque white spots	Opaque white	Digestive gland yellowish	6 denticles
<i>F. violaceus</i> (Risbec, 1925)	Risbec (1953)	New Caledonia	Lamellate	NA	Head yellow greenish, body white with violet gluts	Pinkish with the apex violet	White violet	7 denticles
<i>F. pacificus</i> Baba, 1937	Baba (1937)	Japan	Indistinct constrictions along the whole length	Smooth	Translucent white	Chocolate-tinted except at the distal third which is colorless	Dark yellow with a white cap and a purple marking below	Smooth
<i>F. japonicus</i> Baba, 1949	Baba (1949) Baba & Hamatani (1964), Goshner (1980)	Japan, Hawaiian Islands	2 or 3 bulbs	Papillated	Yellowish with dense opaque white except the cerata	Translucent white	Digestive gland red, yellow or yellowish brown, with opaque white apices	Smooth
<i>F. perforatus</i> Baba, 1949	Baba (1949)	Japan	Perforated	Smooth	Pale rose	Brown	Digestive gland veined with rose-red	5 denticles
<i>F. mirabilis</i> Baba, 1955	Baba (1955) Willan (1983)	Japan	Perforated	Smooth	Whitish, inclined to brown on the back	Dark brown	Brownish with a purple spot down the tip	Smooth
<i>F. auritulus</i> Marcus, 1955	Marcus (1955) Marcus & Marcus (1963), Edmunds (1964), Edmunds & Marcus (1977), Thompson (1980)	Tropical west Atlantic	2 or 3 bulbs	Smooth	Translucent white or gray with white spots, the area behind the rhinophores had an orange center	Brown, tip white	White epidermal pigment, digestive gland almost colorless or pink, grayish or dark brown; endosac white	Smooth or tiny lateral denticles
<i>F. paumotuensis</i> Burn, 1962	Burn (1962), Edmunds (1965)	Australia	Papillate	Smooth	White	White	Fawn with white tips	NA
<i>F. tsurugana</i> (Baba & Abe, 1964)	Baba & Abe (1964, 1975), Willan (1983)	Japan, eastern Australia	2 bulbs or 3 overlapping flanges with their upper margins free	Smooth	Translucent head golden yellow or brownish yellow, body densely covered with opaque white spots, anterior margin of foot yellowish	Black	White dots down the tip. Endosac black. Digestive gland orange	Smooth
<i>F. zhanensis</i> (F.H. Edmunds, 1965)	(Edmunds & Marcus, 1963) (Edmunds & Marcus, 1977), Thompson (1980)	West Africa, Ghana	3 small swellings	Smooth	Translucent grayish-white. A few white dots on head, oral tentacles, back and tail	Tip clean grayish with white dots, the rest purple-brown or maroon	A few white dots on surface, and a few white glands at tip. Digestive gland cream or brown with purple-brown blotches	7-8 denticles

Table 1. Continued.

Species	References	Distribution	Rhinophores	Cerata	Body coloration	Rhinophores coloration	Cerata coloration	Radula
<i>F. fulvus</i> Lemche & Thompson, 1974	Lemche & Thompson, 1974; Edmunds & Marcus (1977)	Northern Europe	3 ring shaped swellings	Smooth	Faint straw-yellowish and semi hyaline. Shining white pigment on the dorsal side of the oral tentacles continuing backwards between the rhinophores	Yellowish brown	Faint yellowish-brown with a narrow almost black strip on the posterior side	Smooth
<i>F. vitreus</i> Ortea, 1982	Ortea, 1982	Canary Islands (Atlantic Ocean)	2 small bulbs	Smooth	Translucent white with opaque white marking on head dorsum and oral tentacles	White	White opaque	4-5 denticles

NA = Information not available.

the other species by the presence of smooth radular teeth (*F. joubini*, *F. gouaroi*, *F. violaceus*, *F. perfoliatus*, *F. ghanensis*, and *F. vitreus* have denticulate teeth). The radula of *F. pannuceus* Burn, 1962, has not been described. However, this species differs from *F. elenalexiae* by the rhinophores and coloration. The cerata are smooth in *F. elenalexiae* (in *F. japonicus* they are papillated) and the inner oviduct does not have a swelling for a fertilization chamber as was described in *F. japonicus* Baba, 1949 and *F. ghanensis*

Edmunds, 1968 (Baba and Hamatani, 1964; Edmunds, 1968). *F. ghanensis* has a small penial stylet.

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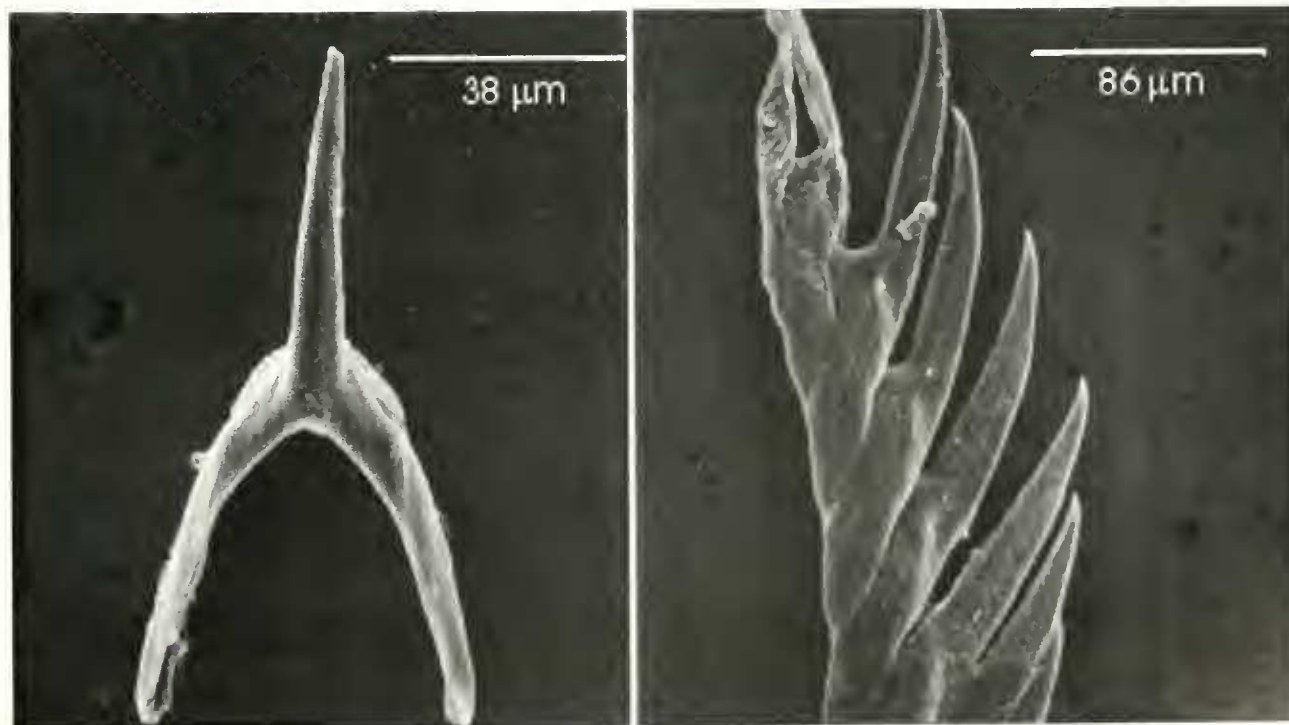


Figure 4. *Favorinus elenalexiae*. Left, SEM micrograph of a radular tooth. Right, SEM micrograph of a lateral view of the radula.



Figure 5. *Favorinus clenalexiae*. SEM micrograph of the masticatory edge of the jaw.

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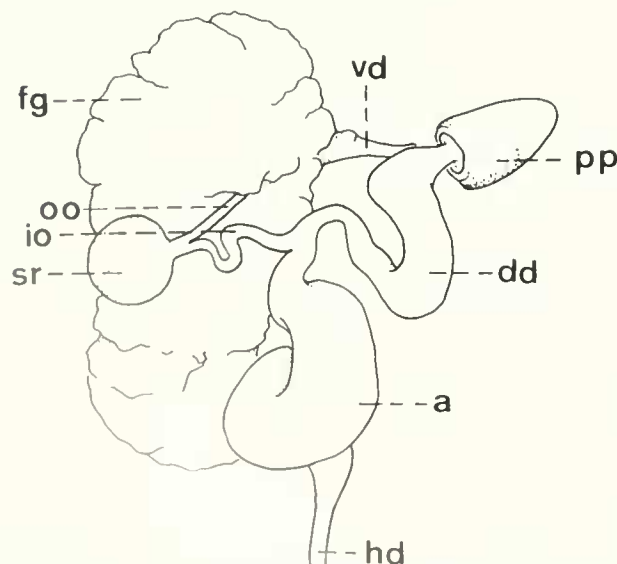


Figure 6. *Favorinus clenalexiae*. Reproductive system. Abbreviations: a, ampulla; dd, detertent duct; fg, female gland; hd, hermaphroditic duct; io, inner oviduct; oo, outer oviduct; pp, penial papilla; sr, seminal receptacle; vd, vaginal duct.



Figure 7. Distribution of *Favorinus clenalexiae*.

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